

Application No. 10/804,332
Response to March 31, 2006 Final Office Action

Docket No.: 60680-1894

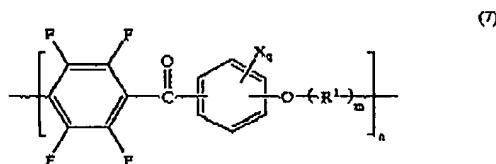
REMARKS

Applicant thanks Examiner Lopez for his careful review of the pending application. In this response, Applicant has not amended any claims. Nor have any claims been added or canceled. Accordingly, claims 1-14 are pending.

Rejection of Claims 12-14 Under 35 U.S.C. § 112, ¶ 2

The Examiner has rejected claims 12-14 as indefinite under 35 U.S.C. § 112, ¶ 2. According to the Examiner, the recitation of "oxy-1,4-phenylene-oxy-1,4-phenylene-carbonyl-1,4 phenylene" in each of these claims does not further limit the recitation of a "polyaryletherketone" in the claims from which they respectively depend. Applicant disagrees. First, the expression "polyaryletherketone" is not specific as to the number of ether groups in each repeating unit of the polymer, whereas claims 12-14 are. Second, the expression "polyaryletherketone" is not specific as to location of the carbonyl and oxy functional groups on the benzene rings. In contrast, claims 12-14 are.

Attached hereto is a copy of Yamaoka, U.S. Published Patent Application Publication No. 2005/0117099. Formula 7 at paragraph 57 of Yamaoka describes the general formula for a polyaryletherketone as follows:



As Yamaoka indicates, "In the formula (7), it is preferable that q=0 and a carbonyl group and an oxygen atom of an ether that are bonded to both ends of a benzene ring are present at para positions." Yamaoka at ¶ 60 (emphasis added). Formula (8) further defines the R¹ functional group and also indicates that the repeating units of a polyaryletherketone can include different numbers of ether groups. Thus, Yamaoka illustrates the difference between a

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polyaryletherketone and the more specific species of such polymers recited in claims 12-14. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Rejection of Claims 1-14 Under 35 U.S.C. § 103(a) Based on Frame and Sakata

The Examiner has again rejected claims 1-14 as obvious under 35 U.S.C. § 103(a) based on the combination of Frame and Sakata. According to the Examiner, Frame discloses an aluminum piston in a steel cylinder having a piston ring in a piston groove, wherein the ring has a thermal set resin coating on a lower surface. The Examiner acknowledges that Frame does not disclose the use of polyaryletherketone coatings. However, he again contends that Sakata teaches the equivalence of such coatings with Frame's PTFE coatings.

"To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." *See also Litton Systems, Inc. v. Honeywell, Inc.*, 87 F.3d 1559, 1569 (Fed. Cir. 1996) (rejecting defendants' obviousness challenge on the grounds that "[t]he prior art simply does not contain many limitations contained in the claimed method"); *Manual of Patent Examining Procedure* (MPEP) at § 2143.03. It is undisputed that neither Frame nor Sakata discloses or suggests *coating* a piston ring with a polyaryletherketone composition. Sakata does not disclose or suggest polyaryletherketone polymer *coatings* for piston rings or the deposition of such compositions on the surface of a piston ring. Instead, its seal rings are made by extruding or injection molding PEEK and/or polyether nitride. *See* Sakata at 2:12-17. For this reason alone, Frame and Sakata do not render the pending claims obvious.

Moreover, the Examiner has not identified a suggestion or motivation in the prior art for combining and modifying Sakata and Frame in the manner necessary to obtain the claimed invention. *See Winner International Royalty Corp. v. Wang*, 202 F.3d 1340, 1348 (Fed. Cir. 2000) (citations omitted) ("When an obviousness determination is based on multiple prior art references, there must be a showing of some teaching, suggestion, or reason to combine the references"). "The absence of such a suggestion [to combine references] is dispositive in an obviousness determination." *Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573, 1579 (Fed. Cir. 1997).

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First, even if--as the Examiner suggests--Sakata taught the equivalence of PTFE and PEEK, one of ordinary skill in the art would not be motivated to replace Frame's compositions with those of Sakata because Frame does not use PTFE alone. Instead, Frame uses a combination of "thermal set resin, polytetrafluoroethylene [PTFE] and molydisulfide," which is sold under the trade name Xylan 1620™. Frame at 2:53-61. Thus, even if one of ordinary skill in the art were to conclude that PEEK and PTFE were "equivalent" based on Sakata, he or she would have no reason to believe that PEEK is equivalent to Frame's *combination* of PTFE with a thermal set resin and molydisulfide. Therefore, one of ordinary skill would have no reason to believe that a PEEK composition could or should be used in place of Frame's compositions.

Second, Sakata simply does not indicate that PEEK and PTFE are "equivalent." In support of his rejection, the Examiner relies on the following excerpt from Sakata's Background of the Invention:

To decrease a degree of the wear or abrasion, a seal ring made of polytetrafluoroethylene (refer to as PTFE), a seal ring made of polyether-ether ketone (refer to as PEEK) which is filled with carbon fibers and PTFE, or a seal ring made of a material composed of PEEK, carbon fibers, PTFE and powder of sericite proposed (see Japanese Laid Open Patent Publication (KOKAI) 262976/1993).

Sakata at 1:33-40. This excerpt does not indicate that PEEK and PTFE are "equivalent." It simply indicates that the referenced publication discloses various sealing rings, some of which include PEEK as a constituent.

Third, Sakata does not indicate that PEEK and PTFE are equivalent for use as piston ring *coatings*. Thus, to use PEEK coatings for Frame's piston rings would require a modification of the references that is not motivated or suggested by the prior art. *See Ex parte Dussaud*, 7 USPQ2d 1818, 1820 (Bd. App. & Int'l 1988) ("The mere fact that the prior art could be modified in the manner proposed by the Examiner would not have made the modification obvious unless the prior art suggested the desirability of the modification"); *see also In re Laskowski*, 871 F.2d 115, 117 (Fed. 1989). The Examiner suggests that because Sakata allegedly discloses that PEEK and PTFE are "equivalent," they must be equivalent *for all*

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purposes. However, one of ordinary skill in the art would readily recognize that the use of a composition to create extruded sealing rings is distinctly different from the use of the composition to create *coatings*, and that success in one application provides no indication of success in the other application. Sakata gives no indication that its PEEK compositions can be used in the manner specifically contemplated by Frame. As Frame states:

Preferably, the Xylan 1620TM is applied to the piston ring by way of dipping, spraying, or rolling. Thereafter, the ring is cured in the oven in accordance with the manufacturer of the Xylan. In tests discussed further below, the inventors applied the Xylan 1620TM by means of dipping and then cured the rings for approximately ten minutes at an approximate temperature of 232° C.

Frame at 3:31-36. Nothing in Sakata suggests that its PEEK compositions can “dipped, sprayed, or rolled” in the manner described above. For this reason as well, one of ordinary skill in the art would *not* be motivated to replace Frame’s thermal set resin/PTFE/molydisulfide compositions with Sakata’s PEEK compositions.

Fourth, Sakata deals with the use of sealing rings for *rotating shafts* not for pistons. Again, one of ordinary skill in the art would not understand that sealing rings useful for Sakata’s rotating shaft applications would function equivalently in Frame’s piston applications. In support of his rejection, the Examiner points to Figure 9 from Sakata, contending that the figure “looks at a conventional piston ring.” Office Action at 2. However, Sakata’s Figure 9 presents data from a “durability test” performed with the apparatus shown in Figure 8. The test is described as follows:

FIG. 8 shows a test apparatus for performing tests of a wear resistance of the shaft of ADC-12Z, a sealability of the seal ring of D material slidable with respect to the shaft of ADC-12Z and a durability of the excellent sealing performance. A *rotatable shaft* 7 is made of ADC-12Z and provided at its outer peripheral surface with a pair of annular ring grooves 8.8 in which seal rings 9, 10 are fitted. Outer peripheral surfaces of the seal rings 9, 10 are in sliding contact with an inner surface of a housing 11

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made of carbon steel (S45 C of Japanese Standard), while the *shaft 7 is rotated*.

Sakata at 5:47-57 (emphasis added).

Figure 9 makes no mention of a “piston ring.” However, in the Brief Description of the Drawings, Figure 9 is described as presenting “oil leakage test” data for Sakata’s invention and a “piston ring made of conventional material.” This description of the tested sealing rings does not indicate that Sakata’s compositions were tested for use in piston applications. Nowhere does Sakata present test data for pistons. Instead, it is limited to rotating shafts. Thus, one of ordinary skill would not be motivated to combine Frame and Sakata in view of their different applications.

As indicated previously, independent claim 6 recites further limitations which distinguish it from the references of record. The Examiner does not address these limitations. As mentioned above, Sakata only deals with reciprocating shafts used “to prevent leakage of oil supplied to the hydraulic circuit.” Sakata at 1:7-8. However, claim 6 recites the use of a polyaryletherketone coating on a piston ring for “a piston adapted to reciprocate within the combustion chamber of an engine.” Nowhere does Sakata suggest using polyaryletherketone materials for *combustion chamber* piston rings. Thus, the specific piston application recited in claim 6 further distinguishes it from Sakata.

As also indicated previously, several of the dependent claims recite additional features which are independently patentable over the combination of Frame and Sakata. For example, claim 2 recites a structure “wherein only said piston groove engagement surface is coated with” a polyaryletherketone polymer. Similarly, claim 11 depends from claim 10 and recites “depositing said composition only on a bottom portion of said piston ring.” Because Sakata’s rings are extruded from PEEK materials, they necessarily lack the structure of claim 2 and cannot be made by the method of claim 11. In addition, claims 4 and 5 recite a piston ring comprised of cast iron and steel and coated with a polyaryletherketone polymer. The references of record do not disclose or suggest such a structure.

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CONCLUSION

In light of the foregoing, reconsideration and withdrawal of the Examiner's rejections are respectfully requested.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 18-0013, under Order No. 60680-1894 from which the undersigned is authorized to draw.

Dated:

Respectfully submitted,

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